CST1204: Introduction to Databases

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Week 2 Session 1

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Agenda

- Teacher/Student Introduction
- Course Introduction
- Introduction to database concepts (Part 1 of 2)

Teacher/Student Introduction

- Name/Something special about yourself?
- How much do you know about IT and Database?
- What prompts you taking this course?

Course Description

- Content
  - Concepts and characteristics of relational database systems.
  - The organization of data including normalization and integrity constraints
  - Structure Query Language (SQL)

Course Communication

- Blackboard
  - Calendar
  - Content
  - Task
- OpenLab: hhttps://openlab.citytech.cuny.edu/shancst1204fall2019/

Class Organization

- Section E324: Mon/Wed 8-9:40p, Namm 1104
- School calendar on CityTech website:
  - Attached syllabus for weekly plan (subject to change)
  - Makeup class on Thu Sept 5th.
- Lecture + lab + test + homework. 2 class hours, 2 lab hours, 3 credits
- Textbook: Pratt, Philip J. and Mary Z. Last. 2009. A Guide to SQL, 9th edition. Boston: Cengage Learning, ISBN-13: 978-1-111-52727-3, ISBN-10: 1-111-52727-X

Grading

- Grading
  - 10% - Participation
  - 40% - Four Exams
  - 20% - Final Exam
  - 30% - Homework Assignments
- Participation is highly recommended
- Weather and emergency policy on City Tech website

Homework

- Homework released at the end of class and due before next class starts
- Two types
  - Q&A: Written in text format and email to instructor
  - Hands-on: Copy SQL as text and result as screenshots, paste into a Word document, and email to instructor.
- Email subject should be: “Homework - <your name> - <YYYYMMDD>”,where YYYYMMDD is the class date

Tests, Tests, and Final Test

- Four Tests: 1hr 40 min session. Will announce in the class before.
- Mid-term: Will provide each student a mid-term score around 10/30.
    - It is a mid-term feedback, not a grading.
- Final exam: 12/18. 1hr 40min. Grade will be available before 12/27.

Academic Integrity Policy

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Hands-on and Lab Environments

- CUNY Oracle Server:
  - Remote Desktop
  - SQL Plus and SQL Workshop
- Oracle LiveSQL
- Students should have their own USB storage devices to store their homework/results

Database Concepts (Part 1 of 2)

- Relational databases
- Entity, Attribute, and Relationship

Database

- Database: a structure that contains different categories of information and the relationships between these categories. (Ch1. Pg 1)
- Enterprise data needs: Google, Facebook, Banks, Supermarkets
    - Data is essential to run business. Enterprises have lots of datasets.
    - Usually large and complex, related to each other in a specific way
    - Think of CUNY: Departments, teachers, students, listed courses, course registrations, etc.

Database Career

- Database is at the center of most enterprise computer applications. Database design and operation in many cases determines the computer application design and operation.
- Database is the foundation of Data Science, Artificial Intelligence, and Machine Learning
    - January 2019 report from Indeed showed a 29% increase in demand for data scientists year over year and a 344% increase since 2013

Database Management System

- The challenge is how to present the datasets in computer.
  - Entry, storage and retrieval of large quantities of information
  - Manage how that information is organized.
- The database management system (DBMS) is the software that interacts with end users, applications, and the database itself to capture and analyze the data.

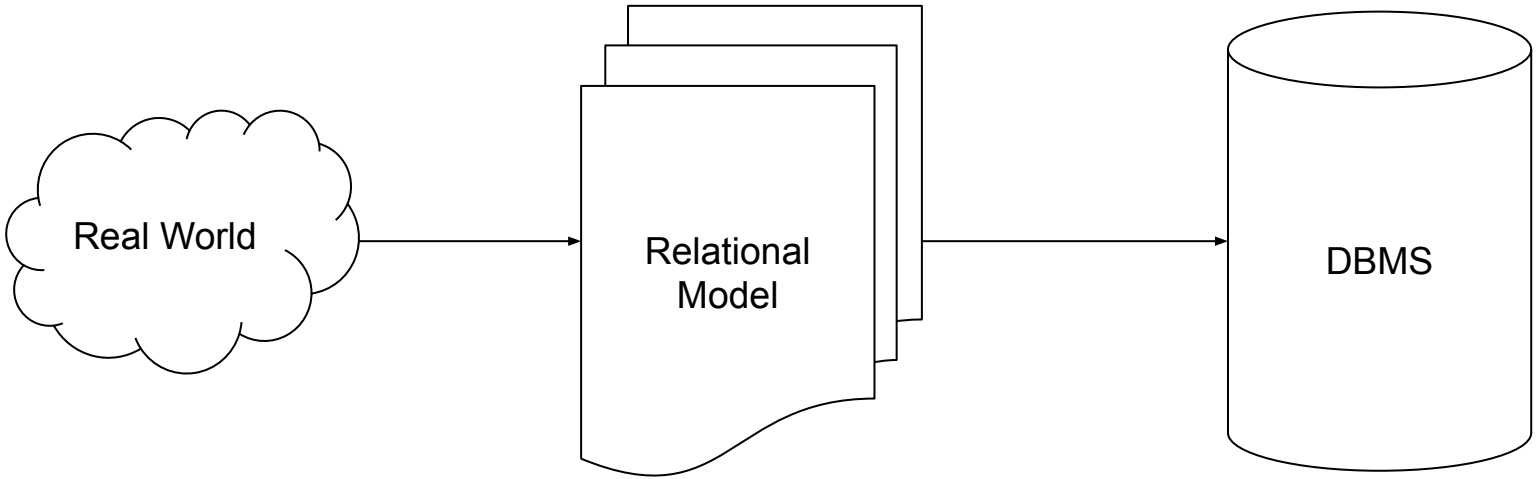
From File to Relation

- File system as DBMS (before 1970s):
  - Data duplication/loss.
  - No clear relationships between files. Hard to manage.
  - Security concerns
- Relational Model by Dr. Edgar F. Codd (1970):
  a. Even the most complex datasets can be represented as *Relations*.
  b. Relations are operated through Relational Algebra.

Relational Model

- Why is it important? Relational Model can be systematically, consistently, and logically represented in DBMS.
  - Has mathematical theory behind it (Relational Algebra)
  - Simple to develop and implement
  - Consistent in results across different platforms
  - Can be applied to almost all business scenarios

Relational Model



Relational Database

- Database that is built on Relational Model
- A collection of tables. Formally, these tables are called relations, and this is how this type of database gets its name. (Ch 2, Pg 22)
- Most commercial or open source DBMS on market today are RDBMS
    - Commercial: Oracle, SQL Server,
    - Open source: MySQL, PostgreSQL

Relational Database (RDB)

- Relational database examples: All 2-dimensional tables
  - Textbook example: Ch 2, Pg 22
  - Oracle Live SQL example
- How to create & organize these tables?
  - How to map real world questions into a relational database?

Relational Database Modelling

- How to create a relational database?
  - Logical Design: Through a systematic process of database modelling, we map real world questions into a logical model which contains entity, attribute, and relationships. The result is a Logical Model.
  - Physical Design: Map the entities and relationships in the Logical Model into database objects such as tables. The result is a Physical Model.

Entity, Attribute, and Relationship

- Entity: a noun; a person, place, thing, or event, such as a Sales Rep (Pg24).
- Attribute: a property of an entity, such as a Sales Rep Number.
- Relationship: the association between entities (Pg24). Usually a verb.
    - Different types of relationships
        - One-to-many: Sales Rep - Customer
        - Many-to-many:
        - One-to-one: State - State Capital
    - Relationships can have attributes (Descriptive Attribute)

Database Representation

- Relation: two dimensional tables in RDB (Pg26)
- Entity/Attribute: One entity per table, and attributes are columns (Pg22)
- Relationship: show the association between entities, aka putting entities in the same table.
    - Two direction linkage (Sales Rep - Customer)
    - Repeating group (Fig 2-2, Pg 25)
    - Must always be unique: Dups provide no new information

Entity Identification

- How to represent entity in a Relationship
  - How many columns do we need to represent an entity?
  - How to identify an entity instance?
- Shorthand representation (Pg27)
  - Qualified names

Hands-on Lab

- Initial survey
- Use shorthand representation to define entities, attributes, and relationships in TAL Distributor database as shown in Ch1.

Homework

- Watch the following video from Computer History Museum:

  https://www.youtube.com/watch?v=KG-mqHoXOXY